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HAGENBUCH et al.

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For: PROCESS FOR THREE-DIMENSIONAL MODELING AND DESIGN OF OFF-HIGHWAY DUMP BODIES

PENDING CLAIMS AFTER AMENDMENTS MADE IN RESPONSE TO OFFICE ACTION DATED MAY 29, 2002

1. (Twice Amended) A body of a vehicle for hauling material, the body made by the following process:

(a) determining an anticipated point of use for the vehicle;

(b) collecting data from the anticipated point of use;

(c) determining a desired location for a load center of gravity on a chassis of the vehicle;

(d) determining a desired volumetric capacity for the body;

(e) establishing an initial line for a floor of the body, an initial line for a front wall of the body and an initial inside body width;

(f) developing a three dimensional volumetric model of a load to be carried in the body defined by the initial floor line, the initial front wall line and the initial inside body width using the data collected from the anticipated point of use with the three dimensional volumetric model having a volume and a volumetric model center of gravity located on the chassis;

(g) adjusting a set of design parameters of the body until the load model center of gravity is located proximate the desired location for the load center of gravity on the chassis from step (c) and the volume of the three dimensional volumetric model is substantially similar to the desired volumetric capacity from step (d); and

(h) producing the body in accordance with the set of design parameters.

2. The invention according to claim 1 wherein the set of design parameters of the body includes a position of the body floor and a position of body sidewalls.

3. The invention according to claim 2 wherein the position of the body floor includes a length of the floor.

4. The invention according to claim 2 wherein the position of the body sidewalls includes a height of the sidewalls.

5. The invention according to claim 4 wherein the position of the body sidewalls further includes a distance between the respective sidewalls.

6. The invention according to claim 2 wherein the set of design parameters of the body further includes a position of the body front wall.

7. The invention according to claim 4 further including the step of adjusting the length of the body floor and the height of the body sidewalls to provide the lowest practical

vertical location for the center of gravity of the three dimensional model of the hauled material.

8. The invention according to claim 1 wherein the data collected from the anticipated point of use includes angles of material repose of an actual load carried in an existing vehicle body.

9. The invention according to claim 8 wherein the angles of material repose include a front angle of material repose, a rear angle of material repose and side angles of the material repose.

10. The invention according to claim 9 wherein the data collected from the anticipated point of use further includes a representation of an actual load carried in an existing vehicle body.

11. The invention according to claim 10 wherein the data collected from the anticipated point of use includes angles of material repose and representations of corner voids present in the corners of a plurality of existing load-carrying vehicle bodies.

12. The invention according to claim 1 wherein the data collected from the anticipated point of use further includes a density of the load material.

13. The invention according to claim 1 wherein the data collected from the anticipated point of use includes a method used for loading material into an existing vehicle body.

14. The invention according to claim 10 wherein the step of developing the three dimensional volumetric model of a load to be carried in the body includes developing the three dimensional volumetric load model to account for corner voids in the vehicle body.

15. The invention according to claim 14 wherein the three dimensional volumetric load model is developed through a gradual incremental blending of the respective side angles of material repose to the front angle of material repose and a gradual incremental blending of the respective side angles of material repose to the rear angle of material repose through respective rounded corners of the three-dimensional model of the hauled material.

16. The invention according to claim 14 further including the step of comparing the three dimensional volumetric load model with the representation of the actual load collected at the anticipated point of use and adjusting the three dimensional volumetric load model as necessary such that the three dimensional volumetric load model substantially matches the representation of the actual load collected at the anticipated point of use.

17. The invention according to claim 15 wherein the incremental blending of the side angles of material repose to the front and rear angles of material repose includes dividing the respective rounded corners of the three-dimensional model into equal segments, establishing a plane in each of these segments at a respective angle which allows an

incremental change in the angles of material repose through the rounded corners of the three dimensional model and extending the planes until they intersect the perimeter of the body.

18. The invention according to claim 1 wherein the step of developing the three dimensional volumetric model of a load to be carried in the body includes developing a generally rounded-off conical three dimensional volumetric load model.

19. The invention according to claim 1 further including the step of adjusting the set of design parameters to provide the lowest practical vertical location for the center of gravity of the three dimensional model of the hauled material.

20. The invention according to claim 1 further including the step of adjusting the set of design parameters to allow material to be loaded into the dump body from the lowest practical vertical location.

21. A body of a vehicle for hauling material, the body made by the following process:

(a) determining a desired location for a load center of gravity on a chassis of the haulage vehicle;

(b) determining a desired volumetric capacity for the body;

(c) establishing an initial line for a floor of the body, an initial line for a front wall of the body and an initial inside body width;

(d) developing a three dimensional volumetric model of a load to be carried in the body defined by the initial floor line, the initial front wall line and the initial inside body width using data collected from an anticipated point of use including at least one angle of material repose with the three dimensional volumetric model having a volume and a volumetric model center of gravity located on the chassis;

(e) adjusting a set of design parameters of the body until the load model center of gravity is located proximate the desired location for the load center of gravity on the chassis from step (a) and the volume of the three dimensional volumetric model is substantially similar to the desired volumetric capacity from step (b); and

(f) producing the body in accordance with the set of design parameters.

22. The invention according to claim 21 wherein the set of design parameters of the body includes a position of the body floor and a position of body sidewalls.

23. The invention according to claim 22 wherein the position of the body floor includes a length of the floor.

24. The invention according to claim 22 wherein the position of the body sidewalls includes a height of the sidewalls.

25. The invention according to claim 24 wherein the position of the body sidewalls further includes a distance between the respective sidewalls.

26. The invention according to claim 22 wherein the set of design parameters of the body further includes a position of the body front wall.

27. The invention according to claim 21 wherein the data collected from the anticipated point of use includes a front angle of material repose, a rear angle of material repose and side angles of the material repose.

28. The invention according to claim 21 wherein the data collected from the anticipated point of use further includes representations of the conical shape of an actual load carried in an existing vehicle body.

29. The invention according to claim 21 further including the step of adjusting the set of design parameters to provide the lowest practical vertical location for the center of gravity of the three dimensional model of the hauled material.

30. The invention according to claim 21 further including the step of adjusting the set of design parameters to allow material to be loaded into the dump body from the lowest practical vertical location.

31. A body of a vehicle for hauling material, the body made by the following process:

(a) determining a desired location for a load center of gravity on a chassis of the haulage vehicle;

(b) determining a desired volumetric capacity for the body;

(c) establishing an initial line for a floor of the body, an initial line for a front wall of the body and an initial inside body width;

(d) developing a three dimensional volumetric model of a load to be carried in the body defined by the initial floor line, the initial front wall line and the initial inside body width including developing a generally rounded-off three dimensional volumetric load model, the three dimensional volumetric model having a volume and a volumetric model center of gravity located on the chassis;

(e) adjusting a set of design parameters of the body until the load model center of gravity is located proximate the desired location for the load center of gravity on the chassis from step (a) and the volume of the three dimensional volumetric model is substantially similar to the desired volumetric capacity from step (b); and

(h) producing the body in accordance with the set of design parameters.

32. The invention according to claim 31 wherein the set of design parameters of the body includes a position of the body floor and a position of body sidewalls.

33. The invention according to claim 32 wherein the position of the body floor includes a length of the floor.

34. The invention according to claim 32 wherein the position of the body sidewalls includes a height of the sidewalls.

35. The invention according to claim 34 wherein the position of the body sidewalls further includes a distance between the respective sidewalls.

36. The invention according to claim 32 wherein the set of design parameters of the body further includes a position of the body front wall.

37. The invention according to claim 31 wherein the rounded-off three dimensional volumetric load model is developed through a gradual incremental blending of respective side angles of material repose to a front angle of material repose and a gradual incremental blending of respective side angles of material repose to a rear angle of material repose.

38. The invention according to claim 37 wherein the incremental blending of the side angles of material repose to the front and rear angles of material repose includes dividing the respective corners of the three-dimensional model into equal segments, establishing a plane in each of these segments at a respective angle which allows an incremental change in the angles of material repose through the front, sides and rear of the three dimensional model and extending the planes until they intersect the perimeter of the body.

39. A body of a vehicle for hauling material, the body made by the following process:

(a) determining a desired location for a load center of gravity on a chassis of the haulage vehicle;

(b) determining a desired volumetric capacity for the body;

(c) establishing an initial line for a floor of the body, an initial line for a front wall of the body and an initial inside body width;

(d) developing a three dimensional volumetric model of a load to be carried in the body defined by the initial floor line, the initial front wall line and the initial inside body width using data collected from an anticipated point of use including a method used for loading material into an existing vehicle body with the three dimensional volumetric model having a volume and a volumetric model center of gravity located on the chassis;

(e) adjusting a set of design parameters of the body until the load model center of gravity is located proximate the desired location for the load center of gravity on the chassis from step (a), the volume of the three dimensional volumetric model is substantially similar to the desired volumetric capacity from step (b) and material can be loaded into the dump body from the lowest practical vertical location; and

(h) producing the body in accordance with the set of design parameters.

40. The invention according to claim 39 wherein the set of design parameters of the body includes a position of the body floor and a position of body sidewalls.

41. The invention according to claim 39 wherein the data collected from the anticipated point of use further includes angles of material repose of an actual load carried in an existing vehicle body.

42. The invention according to claim 39 wherein the data collected from the anticipated point of use further includes a density of the load material.

43. The invention according to claim 39 further including the step of adjusting the set of design parameters to provide the lowest practical vertical location for the center of gravity of the three dimensional model of the hauled material.

44. A body of a vehicle for hauling material, the body made by the following process:

(a) determining a desired location for a load center of gravity on a chassis of the haulage vehicle;

(b) determining a desired volumetric capacity for the body;

(c) establishing an initial line for a floor of the body, an initial line for a front wall of the body and an initial inside body width;

(d) developing a three dimensional volumetric model of a load to be carried in the body defined by the initial floor line, the initial front wall line and the initial inside body width using data collected from an anticipated point of use including developing a load plateau at the top of the three dimensional volumetric load model, the three dimensional volumetric model having a volume and a volumetric model center of gravity located on the chassis;

(e) adjusting a set of design parameters of the body until the load model center of gravity is located proximate the desired location for the load center of gravity on the chassis from step (a) and the volume of the three dimensional volumetric model is substantially similar to the desired volumetric capacity from step (b); and

(h) producing the body in accordance with the set of design parameters.

45. The invention according to claim 44 wherein the set of design parameters of the body includes a position of the body floor and a position of body sidewalls.

46. The invention according to claim 44 wherein the data collected from the anticipated point of use includes angles of material repose of an actual load carried in an existing vehicle body.

47. The invention according to claim 44 wherein the data collected from the anticipated point of use further includes a density of the load material.

48. The invention according to claim 44 wherein the data collected from the anticipated point of use includes a method used for loading material into an existing vehicle body.

49. The invention according to claim 44 wherein the step of developing the three dimensional volumetric model of a load to be carried in the body includes developing generally rounded corners in the three dimensional volumetric load model.

50. The invention according to claim 44 further including the step of adjusting the set of design parameters to provide the lowest practical vertical location for the center of gravity of the three dimensional model of the hauled material.

51. The invention according to claim 44 further including the step of adjusting the set of design parameters to allow material to be loaded into the dump body from the lowest practical vertical location.

52. A body of a vehicle for hauling material, the body made by the following process:

(a) determining a representative point of use for the vehicle;

(b) collecting data from the representative point of use;

(c) determining a desired location for a load center of gravity on a chassis of the [haulage] vehicle;

(d) determining a desired volumetric capacity for the body;

(e) establishing an initial line for a floor of the body, an initial line for a front wall of the body and an initial inside body width;

(f) developing a three dimensional volumetric model of a load to be carried in the body defined by the initial floor line, the initial front wall line and the initial inside body width using the data collected from the representative point of use with the three dimensional volumetric model having a volume and a volumetric model center of gravity located on the chassis;

(g) adjusting a set of design parameters of the body until the load model center of gravity is located proximate the desired location for the load center of gravity on the chassis from step (c) and the volume of the three dimensional volumetric model is substantially similar to the desired volumetric capacity from step (d); and

(h) producing the body in accordance with the set of design parameters.

53. The invention according to claim 52 wherein the set of design parameters of the body includes a position of the body floor and a position of body sidewalls.

54. The invention according to claim 52 wherein the data collected from the representative point of use includes angles of material repose of an actual load carried in an existing vehicle body.

55. The invention according to claim 52 wherein the data collected from the representative point of use further includes a density of the load material.

56. The invention according to claim 52 wherein the data collected from the anticipated point of use includes a method used for loading material into an existing vehicle body.

57. The invention according to claim 52 wherein the step of developing the three dimensional volumetric model of a load to be carried in the body includes developing a generally rounded-off conical three dimensional volumetric load model.

58. The invention according to claim 52 further including the step of adjusting the set of design parameters to provide the lowest practical vertical location for the center of gravity of the three dimensional model of the hauled material.

59. The invention according to claim 52 further including the step of adjusting the set of design parameters to allow material to be loaded into the dump body from the lowest practical vertical location.